

# **North Carolina State Government Application Portfolio Management**

## **Management of Legacy Applications Key Underlying Concepts and Theories**

**August 2006**

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# **I. Purpose**

The purpose of this document is to explain the key concepts, theories, and practices underlying the management of legacy applications. (For this document, legacy applications are defined as applications that are in operation, regardless of age or technology). IT outlines and summarizes the approach for identifying, analyzing, and rectifying legacy application issues.

## **II. Introduction**

A well-known fact is all applications have finite useful, economic, or technical lives. Like every corporate asset, they have life cycles and expiration dates. They must be well managed for maximizing benefits over their useful lives, and their dispositions must be determined, planned for, and performed.

At some point in time, applications no longer (a) support business/program goals or objectives, (b) are cost-effective to operate or maintain, and/or (c) are risk-justified by presenting too great a likelihood of failure with unacceptable adverse consequences. These conditions may be caused by a variety of factors, including outdated technology, unsupported vendor components, limited supply of staffing resources to maintain them due to an aging workforce, and ever-changing and more demanding business/program requirements that require increasingly numbers and/or more difficult modifications, which may call for more advanced and newer technical capabilities. In some cases, the business/program requirements have outgrown the original designs and capabilities of the applications, so that they are being forced or asked to do things that they were not built to do.

Applications, especially older ones, present the following challenges:

- Because they were built one for a specific purpose or tightly scoped governmental initiative, they are difficult to integrate in order to present a single combined and streamlined business process or a one-stop service to the public.
- Because they were not designed or constructed under an enterprise information or technical architecture, over time, they have demanded new and different components in the supporting data and technical infrastructures; thereby, reducing the opportunities for standardization, increasing complexity of configurations, increasing cost of operations, creating additional security vulnerabilities, and complicating disaster recovery and continuity of operations.
- Because they have been allowed to proliferate, they continue to require an ever-expanding portion of the scarce total IT budget. If this trend continues, they will leave little or no fiscal resources for new initiatives or projects.

Applications, therefore, present problems and challenges that must be addressed, ideally in a timely, orderly, and disciplined manner. Failure to do so can result in excess operating costs, inefficient employment or misuse of personnel or other (especially fiscal) resources leading to missed opportunities for better investments, impediments to the reengineering of business processes to improve staff productivity and/or offer better or additional services to citizens, and/or the experiencing of an untimely and unforeseen application failure with cataclysmic repercussions.

### **III. Overview**

The management of applications is an integral and important part of the overall management of IT investments. In summary, it involves an inventory of all applications and the evaluation of each to determine whether: (a) it continues to be necessary for conducting business; (b) it is not redundant by containing the same data and performing functions similar to other applications; (c) it gives business value by providing intended information within determined safeguards and at reasonable costs; (d) the level and dependability of available staffing to enhance and support it is adequate; and (e) the underlying technology is stable, can safely be extended in life, and is supported by vendors.

Assessments must be conducted to determine the best management life cycle actions and ultimate disposition of each application. Options for useful life management actions and disposition include: (a) continued maintenance and minor enhancements to meet evolving business needs, (b) modernization (structural changes to significantly enhance functionality or re-architect to update or refresh technology), (c) retirement with replacement (software package or custom designed system), (d) retirement without replacement (consolidate redundant applications or eliminate the need for the application), or (e) outsource (application by itself or application and the business process).

As a general rule, applications that contain vital components (such as platforms, database management systems, etc.) that are no longer supported by vendors and/or cannot continue be supported internally should be eliminated/replaced. Others may be tolerated or transformed if they continue to meet business/program needs in a secure and cost-effective manner.

### **IV. Background on the Management of Applications**

The primary reasons for managing applications are to a) optimize benefits-costs over their life cycles and b) realize savings from reducing the number of them and/or more effectively allocating spending among them. Ideally, costs saved or avoided may be reallocated for new technology initiatives that offer greater value to the organization. The primary goal for the better management of applications is to apply an ongoing and sustainable approach for maximizing the cost-

effectiveness of agency and state application portfolios, and this is accomplished by:

- Determining the status (often referred to as health) of applications. Evaluation criteria may include strategic value to the organization presently and in the future, ability to satisfy business needs, fit with business and technical architectures, cost to operate and maintain, and technical and business risks.
- Making cost-effective life-cycle decisions. From an analysis of the current applications portfolio, develop a management migration plan (called “roadmap” in the application portfolio management tool) for each application. Future intentions may include, retirement without replacement (elimination), retirement with replacement, consolidation with application(s) performing similar business functions, modernization/enhancement, or on-going normal maintenance.
- Determining the priorities of and timeframes for the implementation of management decisions. The timing of significant actions depends on the criticality of the application to the operations of the organization and the urgency of the need to take the action. Unless dictated otherwise, mission critical or strategic applications experiencing high risks or severe problems should receive priority over low value ones with low risks or minor issues.
- Preparing funding requests to enable management actions. Business cases justifications for renovations or replacements should include resource requirements to effect the actions and benefits or value that will accrue from them. Resource requirements may involve fiscal, personnel, and infrastructure needs. Benefits may include better strategic business alignment, enhanced architecture fit, increased productivity, operational savings, improved business processes, greater standardization of technical infrastructure, better reliability and maintainability, and/or risks avoided or mitigated.

The overall intents of application management are to: a) justify each application (save money by eliminating or consolidating those not needed or not providing adequate value for dollars spent); b) rationalizing the application portfolio by targeting maintenance, enhancement, and replacement funding to achieve the most strategic value for the investments; and c) renovate or retire/replace those applications no longer cost-effective or risk acceptable.

In general, applications that satisfy a significant portion of the business function, are aligned with business goals and objectives, are on standard platforms that deliver high-quality service, continue to be supported by quality vendors, are architecturally acceptable, and require available skill sets may not need

additional funding for reengineering or replacement projects. However, applications that no longer provide sufficient business value, are technically obsolete, run on non-standard platforms, are costly to maintain or operate, present unacceptable security or operational risks, or use declining or irreplaceable skills should be modernized or retired. Applications no longer mission critical, no longer supporting high-value business processes, or offering functions and capabilities duplicative with others are candidates for consolidation or elimination.

The management of applications portfolios uses similar strategies and disciplines as those employed by financial managers. By assessing assets continuously, portfolios are optimized by determining which applications receive current, lower, or increased levels of funding and which ones are targeted for renovation, consolidation, elimination, or replacement. By prudent and wise decisions and actions, portfolio managers should manipulate assets so that the portfolio as a whole reflects the greatest business value and closest architectural fit with the lowest costs and risks.

Historically, applications management has concentrated on the understanding individual applications and the development of plans to optimize the business value of each and the combined portfolio over time. The scope of analyses and planning is changing, as many applications together may support multiple interconnected business processes and there are more functional and technical interactions among applications. In today's more complex business and technical environments, systems of applications must combine as a kind of "super application" to deliver synergistic capabilities. The definition of "application" becomes academic when considering that applications can be composed from other applications, which, in turn, are composed from yet other pieces. Therefore, the management of applications must consider at least four levels: 1) individual applications, 2) combinations of technically and/or functionally interconnected applications (applications forming a system of applications), 3) the portfolios of particular types of applications, and 4) the application portfolio as a whole.

## **V. Steps for Managing Applications**

The four-step approach for the better management of applications is described below in separate sections. Appendix 1 contains a graphical representation of the overall approach.

The diagram below highlights the major issues associated with the management of legacy applications.

# Issues Surrounding Systems Obsolescence

Over time, sustainability of applications becomes questionable due to age and technology advances, combined with changed business needs. They no longer:

- a) support business goals and objectives,
- b) are cost-effective to operate or maintain, and/or
- c) are risk-acceptable by presenting too much security vulnerability and/or too great a likelihood of failure with cataclysmic consequences.

## Business Issues

- Impediment to the implementation of new and more cost-effective service delivery models – unable to respond to demands for new functionality or expanding user base, support business processes, or provide adequate and secure information access
- Becomes a constraint in meeting regulatory or compliance requirements

## Staffing Issues - Unavailability of Skills

- Unavailability of staff skills or expertise to maintain
- Unavailability of third party vendors
- Dependency on individual contractors

## Technology and Operational Issues

- Expired warranties, with no vendor support
- Can not handle increased usage or volumes of data
- Does not run anymore on available platforms
- Inefficient IT resource utilization
- Used beyond original intent, and cannot be enhanced
- Cannot meet security, privacy, or confidentiality requirements
- Are not easily recoverable for disaster recovery and business continuity
- System can fail, with untraceable error
- Inconsistent or inadequate information and data quality



*Seems to run forever, but ultimately has a finite business, economic, operational, and/or technical life*

## Step 1 – Collect, Validate, and Maintain Data

This involves the creating and maintaining of the repository of data for each application. IT can be a major time-consuming task; however, it is mostly a one-time exercise, as the vast majority of data remains static over the application's useful life. Regular annual updates are required for costs, and ongoing updates must be made as they are generated by renovations, enhancements, and other renewal activities. Initial data is entered as part of the implementation of the application portfolio management (APM) software tool and as application development projects transition to operational or pilot stages.

Data elements can be group into the five categories outlined below.

- **Identification and general information** – including name and description, business and IT owners, application type, business processes enabled, business value or criticality to the organization, and user information.
- **Fiscal (primarily cost) data** – operational and maintenance costs, and forecast of renovation or replacement expenses.
- **Functional quality** – ability to support/enable current and future business needs.

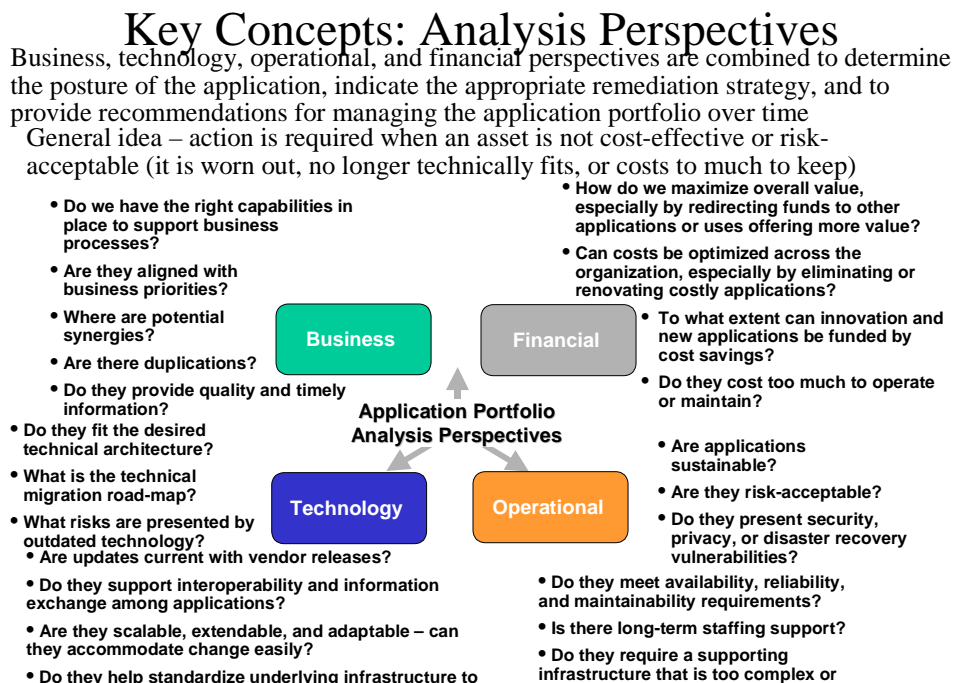
- **Technical quality** – fit with agency and statewide technical architectures and operational quality.
- **Risk profile** – ability to meet security, privacy and confidentiality, DR/BCP (COOP), and respond to business and technical vulnerabilities.

## Step 2 – Perform Assessments

The intent of this step is to identify problems or issues related to the management of applications. The analyses and reporting capabilities of the software tool are used to answer key questions in the areas of business (functional), technical, risks (vulnerabilities), and fiscal (costs). The result is an evaluation of each application and the portfolio related to the following:

- **Status (health)** – business/functional, technical/operations, DR/BCP (COOP), operating and maintenance costs, and funding reliability.
- **Value** – strategic for agency missions or governmental initiative, essential for business criticality or regulatory compliance, and agency and enterprise architecture fit.
- **Risk** – business and technical (especially for unrecoverable failure).

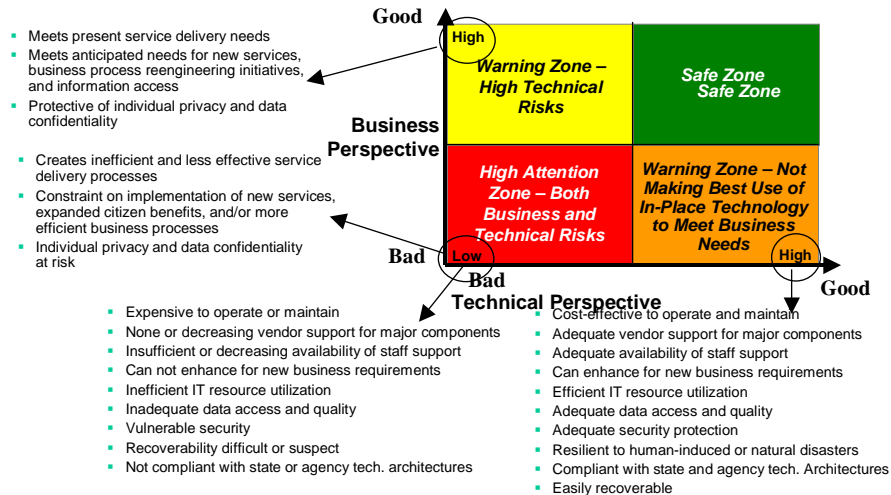
The two diagrams below illustrate example questions for some of the areas reviewed and the types of analyses performed.





# Application Portfolio Management - Determining the Posture of Applications

Generic criteria are defined to assess applications from a business and technology perspective



The following table provides some major criteria that may be used to evaluate applications.

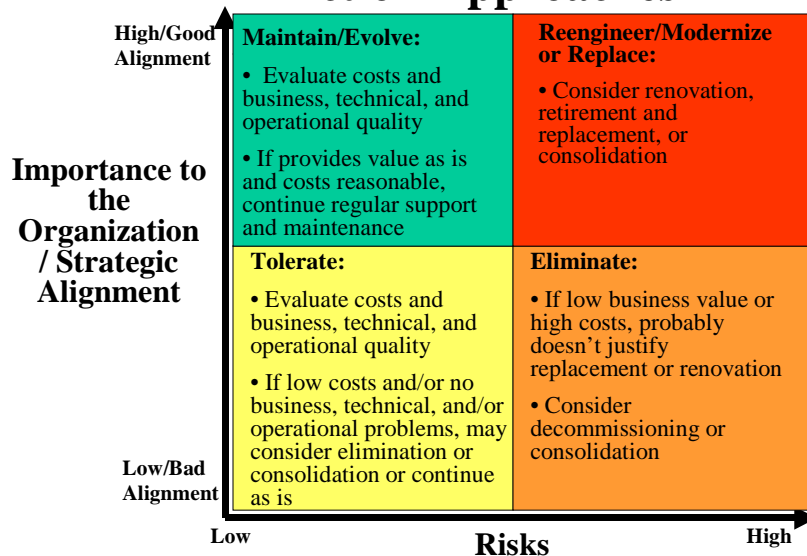
Assessment Criteria	Key Measures	Source of Data
<u>Strategic alignment</u> – the ability to support the organization's business and program strategies, future direction, and required pace of change and to provide useful and timely information for decision making	Aligns with present and future needs Supports critical business and program functionality Provides timely and meaningful access to strategic information	Primarily from agency business and program executives and higher-level managers
<u>Risk</u> – The ability to maintain on-line functionality in support of current and future business, program and technical objectives, including reliability/dependability and security	Risk of technical and/or business or program obsolescence Risk of catastrophic failure Risk of system security failure or violation	Primarily from agency technical staff supporting applications
<u>Operational impact</u> – the ability to lower ongoing operational costs, meet functionality and usability metrics, improve business or program process metrics, and provide useful information for decision making purposes	Operational costs Transaction volume statistics Business process metrics Functionality and usability metrics Ability to provide operational information	Primarily from the agency users (business and program), accounting/budgeting (cost reviews) managers and staff
<u>Technical capability</u> – an assessment of the stage in the application life cycle and the scalability, performance, flexibility, reliability, maintainability of the application	Reliability and performance metrics Flexibility and scalability Fitness and support for the underlying technology	Primarily from agency technical staff supporting applications
<u>Interoperability</u> – an assessment of the applications' ability to communicate currently and in the future with other systems, the mechanisms of the interfaces, and the data being exchanged	Number of interfaces Interface types and formats Data integrity Timeliness	Agency business, program, and technical staffs

### Step 3 – Determine Dispositions and Transition Roadmaps

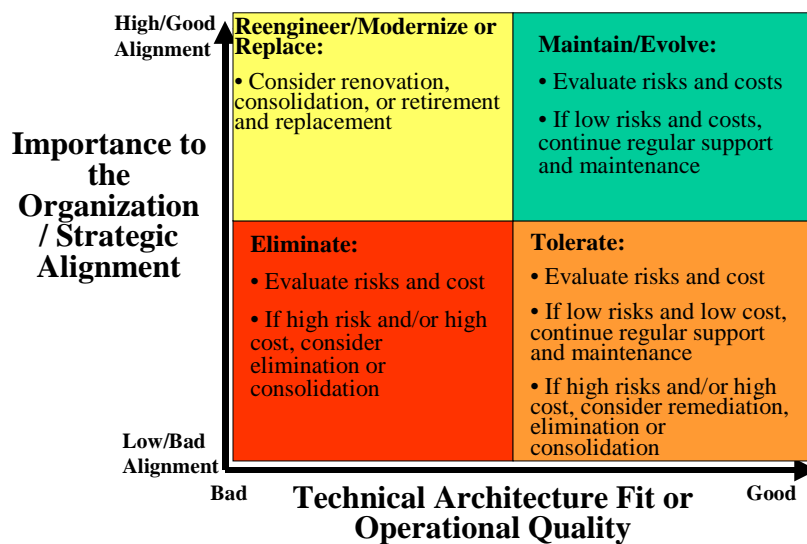
The actions of this step are those necessary to manage the portfolio. The intents are to identify problems/opportunities, determine alternative approaches for addressing them, and developing best actions for managing applications over their life cycles. Considerations involve the areas of 1) cost-effectiveness (e.g., opportunities for a) savings, b) improved support for business processes, c) standardization and consolidation of infrastructure, and d) elimination or consolidation of applications); and 2) risk-acceptability (business, technical, funding, compliance, security, etc.). Decisions must be made whether to 1) continue ongoing maintenance; 2) invest funds for technical renovation/enhancement, functional enhancement, or replacement and retirement; 3) sunset or eliminate; or 4) replace and consolidate as part of an agency wide or state wide initiative.

The diagrams below provide some insight into the evaluation and decision-making processes.

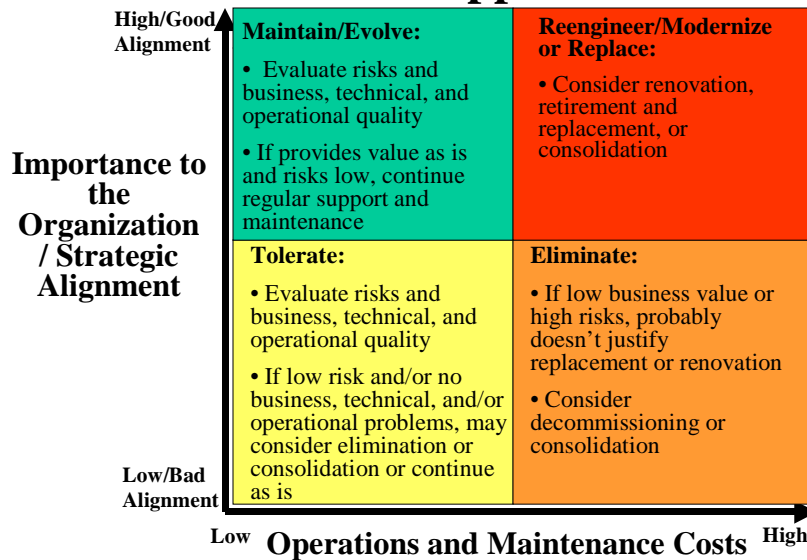
## Application Portfolio Management - Action Approaches



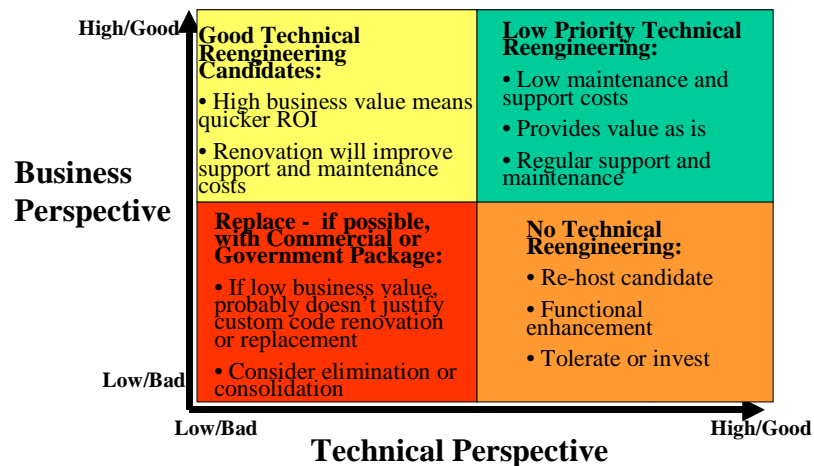
## Application Portfolio Management - Action Approaches



## Application Portfolio Management - Action Approaches



## Application Portfolio Management - Remediation Approaches



### Step 4 – Determine Priorities, Timeframes, Costs and Benefits

The intent of the activities of this step is to optimize the portfolio by taking actions in the right sequence to maximize the benefits and value of the organization's asset inventory. This approach is analogous to the management of a financial

asset portfolio, where high-value, low-cost, and low-risk assets are kept and low-value, high-cost, and high-risk assets are modified or disposed of. Actions are taken on individual applications to move the composition of the portfolio to the position desired relative to value, costs, and risks.

There are many factors to consider in the development of a priorities and timetables for the remediation or disposition of applications. These include:

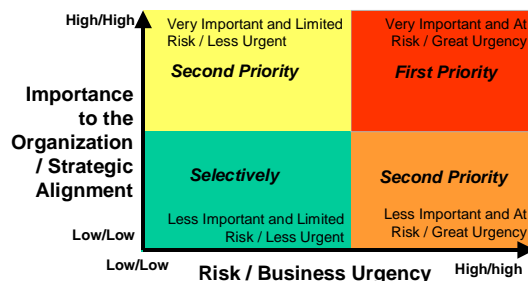
- Level of investments (including fiscal and personnel resources) required for remediation or replacement and budget restraints.
- Urgency of addressing high-risk, mission critical, and/or problematic/failing applications, with potential adverse political, economic, and/or societal repercussions from failure.
- Need for aligning with agency missions, mandates, and strategies or governmental priorities and initiatives.
- Opportunities for immediate and significant increases in the efficiency of operations (or productivity of staff), with attendant cost savings or cost avoidance to repay expenses of remediation or disposition.
- Opportunities for providing significant and long-lasting benefits in the areas of program results, services to the state's citizens, businesses, and/or employees, and/or better and less costly government, especially in areas where new business requirements cannot be fulfilled without remediation or disposition action.
- Opportunities for realizing cost savings resulting from economies of scale and synergies of effort that are achievable from a coordinated approach among agencies.
- Opportunities for reducing total cost of ownership of assets over the longer term.

The priorities and timetables must address criticalities for the remediation or disposition investments; proposed impact on agency, business, and program operations; value and benefits to the public and the state resulting from successful remediation efforts; and involvement of business and program owners, agency technical staff, and interest groups. The sequencing of major activities and the estimation of cost, personnel, and other resources should be delineated. In addition, the use and establishment of a project office for overseeing, coordinating, and supporting the individual remediation or disposition projects and the overall governance structure should be considered.

The diagram below illustrates the conceptual scheme for determining the priority of action for applications. Everything else being equal, the applications most important to the agency and at the greatest risk of failure or presenting the greatest benefits or value from modification, replacement, etc. should receive the highest priority.

## Application Portfolio Management - Investment Selection and Prioritization

Prioritization and timeframe for action are driven by overall importance to the organization/strategic alignment of application, business urgency for remediation, and risks.



In addition prioritization is driven by:

- Specific business initiatives, programs, and/or funding streams available
- Overall risk issues, interrelationships between applications, and the general need for modernization of legacy systems

“Very Important and At Risk/Great Urgency” are highest priority where level of risks and degree of urgency drive remediation activities

“Very Important and Limited Risk/Less Urgent” applications are second priority compared to above due to less strategic importance and/or mission criticality

“Less Important and At Risk/Great Urgency” applications are also second priority for remediation, but may deserve slightly higher consideration due to high risk and more pressing business urgency

“Less Important and Limited Risk/Less Urgent” are lowest priority

## Summary – Comments on a Long-Term Strategic Approach

The state’s applications portfolio is made up of approximately a thousand applications of different vintages, various technologies, and diverse levels of value (measured in terms of contribution to society, service to constituents, and political appeal). Sound portfolio management requires constant review, evaluation, and reworking to make it maximally effective (i.e., optimize life cycle cost, quality, risks, and value). While there are no rules for mandating a target average age and refresh rate, the evolving needs of the state’s businesses and expanded technical possibilities suggest that older applications will reach a point where the demands placed on them are well beyond their original design points, and they are no longer economic to maintain or present unacceptable risks.

Determining the point of economic, functional, and/or technical non-viability can be problematic. Applications become intertwined with each other, and business processes become highly dependent on specific implementations. These factors can lead to a long trail of applications that are minimally maintained, of marginal use, and not subject to retirement. The result is a slow but steady growth in the size of the application portfolio and the creation of a special group of applications that becomes older and more intractable over time. The cost of the expanding

portfolio and the special group of applications ties up fiscal and personnel resources that should be better deployed. Gartner's advice is to reduce the number of legacy applications by 10 percent a year.

Per Gartner, applications targeted for replacement may include:

- “Low-hanging fruit” – Those that are peripheral but not mission-critical.
- Core applications that are operationally required or even mission-critical and are very difficult to move, but might produce huge benefits if the effort were put forth to replace them.

An important consideration is that most applications – even some very old ones – should not be retired. Their contributions may be significant, and the cost of change is not justified for mere technical or architectural improvements.

This above strategy will improve the overall health of the portfolio and improve the contribution of needed legacy applications. However, over time, things may become more difficult. The low-hanging fruit is gone, and the applications needing change are progressively more invasive to touch (tougher to renovate and/or more expensive to replace). At some point, the evolutionary approach to application redemption may have to shift to a more revolutionary one.

An increasingly more pervasive influence on applications management is the changing roles of applications versus the business processes that they support. Historically, business processes lived inside applications, and they were tied inextricably to applications functionally. Business processes were implemented within application code and linked directly to the supporting applications. Today, the trend is for business processes to be abstracted from their abstractions, and they are being accomplished through event chains or networks that span multiple applications or services. As a result, business processes are becoming the central points of control; therefore, applications are being superseded as the fundamental building blocks of the business activities of the organization.

This phenomenon has put additional pressures on applications management. Alternatives for application plans include:

- Replace.
- Continue to maintain and/or renovate.
- Wrap with services to enable service-oriented architecture “hybrid” approaches.

## **VI. Business Cases, Funding Requests, and the Role of Applications Management in the Agency IT Planning Process**

Irrespective of the approach, plan, and timetable selected for the remediation of legacy applications, business cases must be developed to justify these investments. In addition to providing useful information that helps funding authorities understand the value of rectifying or replacing applications and deciding whether to appropriate the necessary funds, business cases guide the subsequent work to ensure the remediation or replacement projects are successful and the results deliver the expected value to the state and its constituents. In short, business cases detail the need for investments, quantify funding requirements, specify timetables, point out major risks, enumerate benefits, describe how they will be achieved, and identify who is accountable for achieving them. The legacy applications problem took many years to evolve; therefore, it will not be solved quickly. Accordingly, a multi-year funding strategy may be appropriate for the business cases.

Potential benefits from the renovation or replacement of applications include:

- Cost savings or avoidance for technical operations and maintenance.
- Greater support of reengineered business processes and/or increased productivity of business staff.
- Better enabling of agency business strategies and missions and/or political initiatives.
- Simplification of DR/BCP, security, privacy, and confidentiality.
- Better adherence to agency and state technical architectures.
- Greater scalability and better reliability and maintainability.
- More support for standardization and consolidation of infrastructure.

Major benefits from investments for modernizing or replacing legacy applications do not accrue just from the upgrading functional capabilities or introducing more modern technology. Large and long-term value results from the technology enabling the offering of more, better, timelier, and business- and citizen-centric services, while increasing the productivity of personnel and improving the outcomes of programs. Moreover, the planned and orchestrated merger of technology renewal with business process reengineering is necessary to effect the achievement of significant and long-lasting benefits from the remediation or replacement of legacy applications. A “rule of thumb” is 20% of benefits comes



from replacing software/hardware, 80% comes from replacing both systems and business processes, and 100% of benefits accrues from changing technologies, reengineering processes, and aligning IT strategies and plans with those of the agency/organization as a whole.

A long-term strategy must be developed to guide the continuing management of legacy applications over their life cycles. Similar to the operation of a motor vehicle, the delay or absence of the maintenance and care of applications will result in less efficient operations, increased risk of untimely failures or problems, and extra costs for major repairs/enhancements. The lesson is: if you ignore or under-maintain them, they become more at risk over time, and the costs to fix them when they fail are much higher.

Preventing applications from slowly becoming failing or problematic legacy systems requires the active sustaining of them. Sustaining applications is different from maintenance in that the maintainability and changeability of the code must be retained even as modification requests are satisfied. Sustaining the application means taking the time to repair defects correctly and not simply patching the code. It may also require technology refresh and architectural evolution.

To accomplish the sustaining of applications, maintenance efforts should be punctuated with modernization projects, such as revamping an existing user interface, targeting a system to a new platform, or replacing a hierarchical database with a relational database-management system, etc. The potential for success in sustaining systems can be greatly improved by building applications from the ground up with this in mind, such as using n-tier architecture.

Applications should be reviewed and evaluated and cost-justified maintenance, enhancements, and replacements should be determined on an ongoing, regular, and near-continuous basis. As a minimum, these reviews should take place and application plans (roadmaps) developed as part of the state's biannual business and IT planning endeavors. This approach should provide for fiscal stewardship by minimizing total life cycle costs, while providing cost-justified risks. Legacy applications should be retired (with or without replacement) when they meet one or more of the following criteria:

- Are no longer aligned with agency missions or strategies and/or support business goals or objectives.
- Provide functions duplicative of one or more other applications (candidate for consolidation with like applications or elimination).
- Are no longer cost-effective to operate or maintain.
- Cannot be renovated in a cost-effective manner.

- Are no longer risk-justified (too many vulnerabilities with severe impacts).

Good management of legacy applications will optimize the returns from these investments. A best practice for the management of applications is the development of a management plan (i.e., roadmap) for the remediation, sustaining, enhancing, upgrading, retiring, and/or replacing of applications. The plan should address:

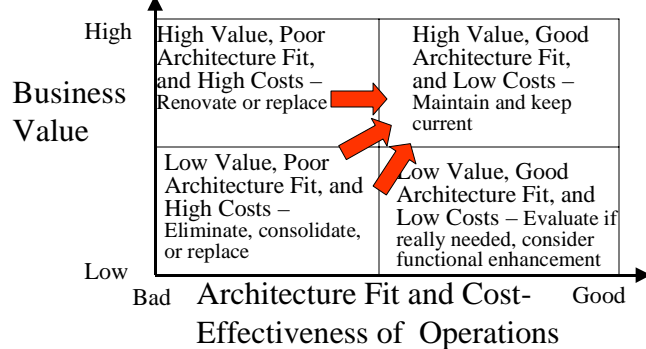
- The timing of major sustaining efforts (such as re-architecture, re-platform, etc.) and retirements, replacements, and other disposition actions for applications.
- The funding and other resources needed to accomplish the sustaining and remediation or disposition activities.
- The alignment with the agency's business strategy and IT plan.

The process described in the preceding can be called application rationalization, and it involves the continuous review and evaluation of applications, the determination of actions to be taken to maximize value for costs and risks, and the development of business cases and other funding justification or budget redirection requests to effect improvements. Although performed on an application-by-application basis, the intent is to maximize the applications portfolio as a whole. This takes time, and a longer-term perspective should be employed. It may be an incremental process – the timing and pace dictated by business needs, level of risks, and funding availabilities. However, it should be performed in a disciplined, focused, and unrelenting manner. An overview of the rationalization process is illustrated in the graphic below.

## Application Rationalization

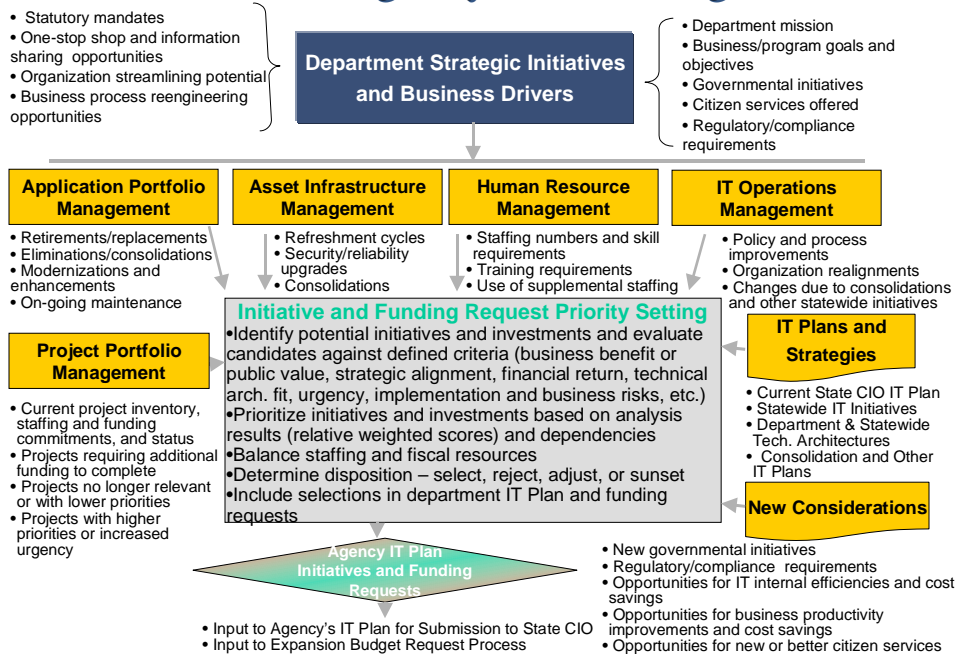
Rationalization implies the use of logical processes, rational thought, and agreed upon principles to weed out unwanted items and effect change. The rationalization of applications portfolios involves a step-by-step process conducted on an application-by-application basis with agreed upon methodologies and criteria and within a decision-making governance model to:

- 1) reduce the number of applications by the consolidation of those performing similar functions and the elimination those of low value and high cost, and
- 2) remodel or replace those providing value but not fitting technical architectures, requiring high cost, and/or presenting exposure to unacceptable risks.

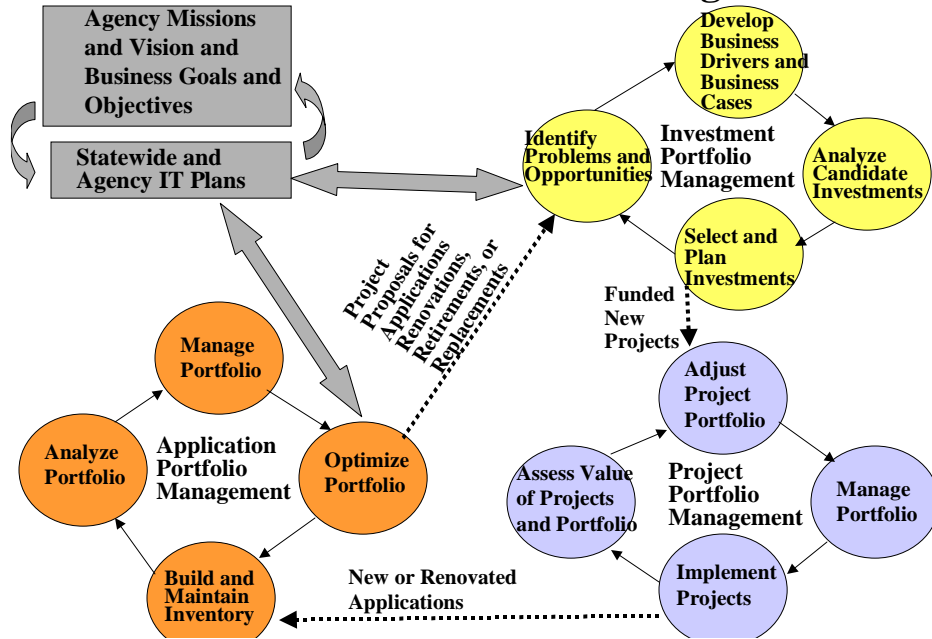


The diagrams below show the role of applications management in the overall activity of agency IT planning and investment portfolio management.

## Overview of Agency IT Planning Process



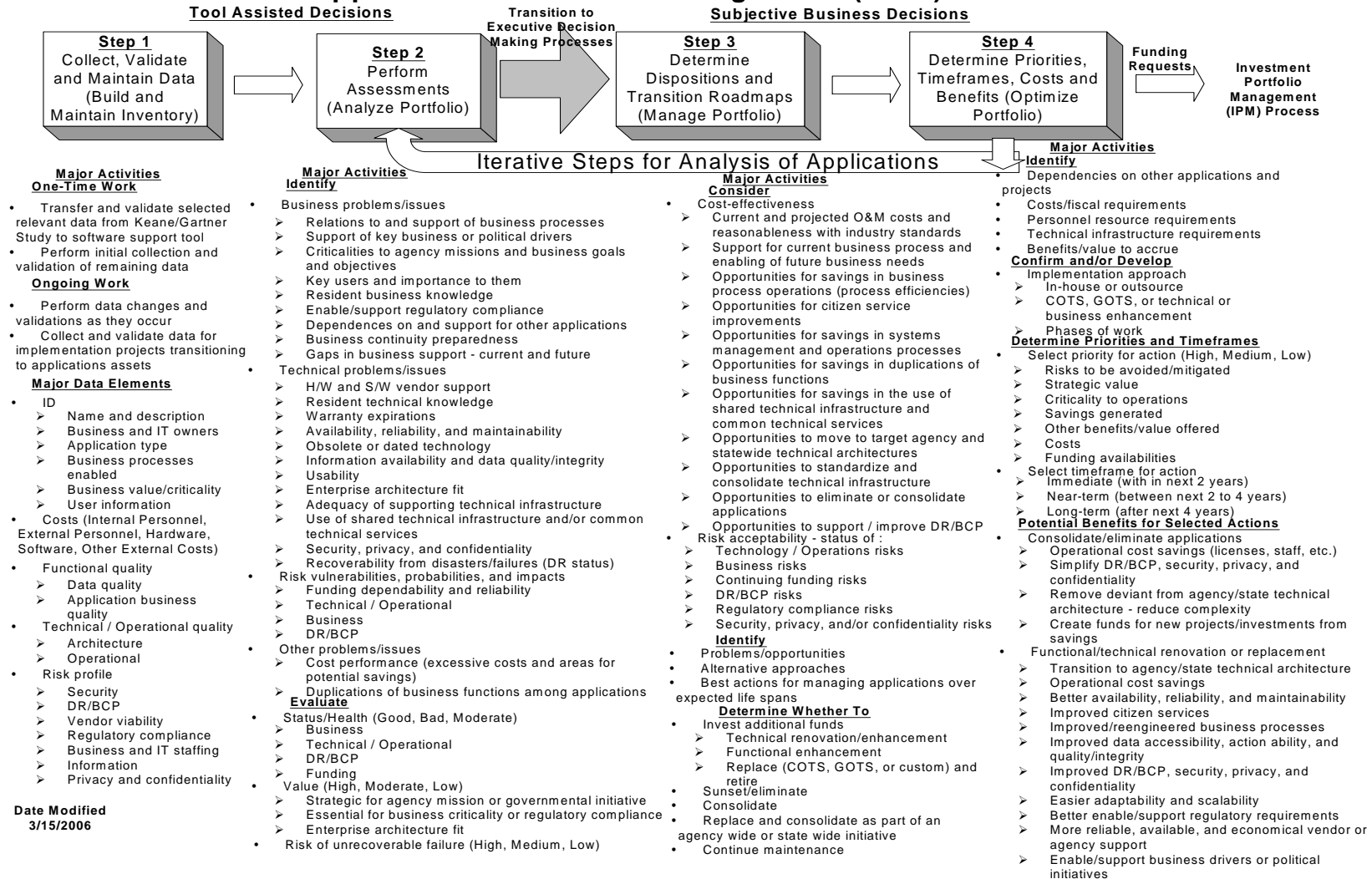
## Overview of IT Portfolio Management



# **Appendices**

## **Appendix 1 – Applications Portfolio Management (APM) Process**

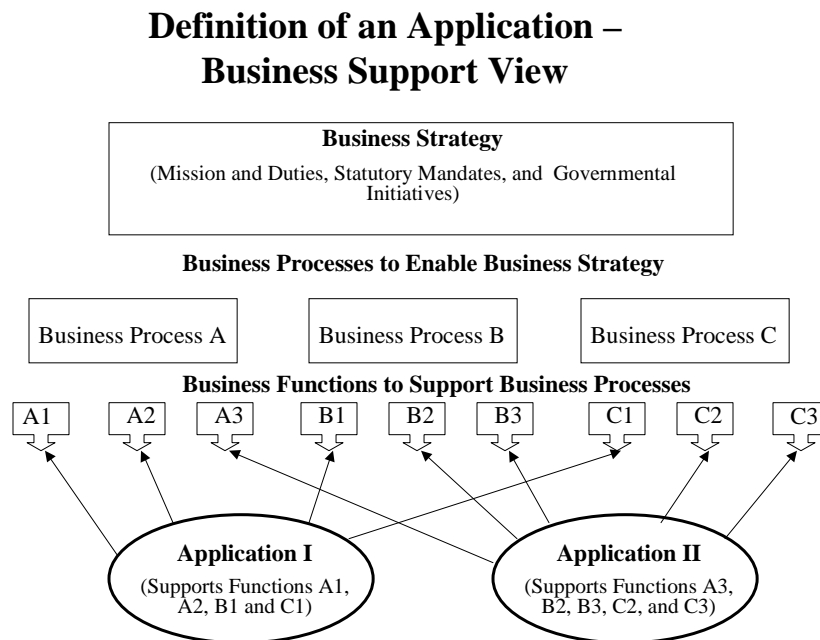
# Applications Portfolio Management (APM) Process



## Appendix 2 – Definition of an Application

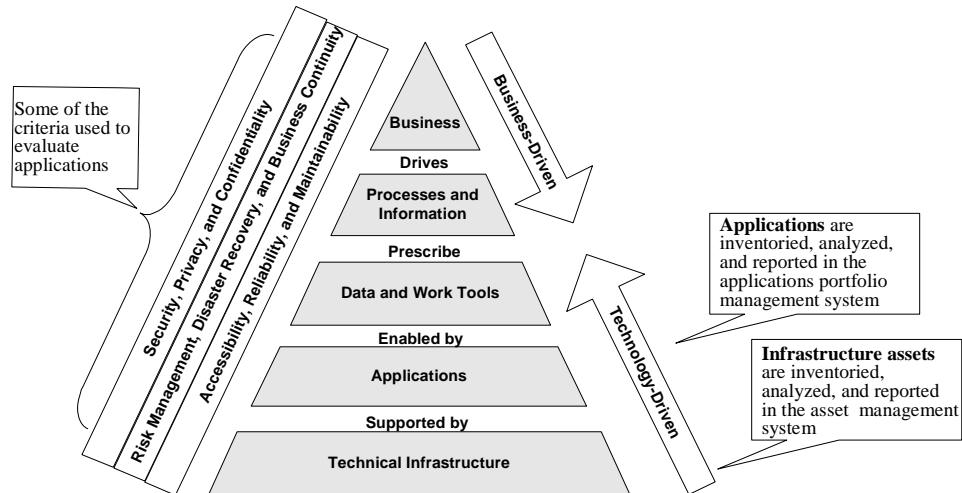
An application may be defined as “a computer system (potentially including multiple programs, modules, etc.) that is designed to accomplish operational tasks or functions that help a user perform his or her work.” The point of this material is to elaborate upon this definition and to explain more clearly, what is an application from the point of view of the application portfolio management initiative. Three perspectives (business view, business/IT alignment view, and technical view) may be helpful, and these are illustrated below.

The following diagram illustrates the **business view** of an application.



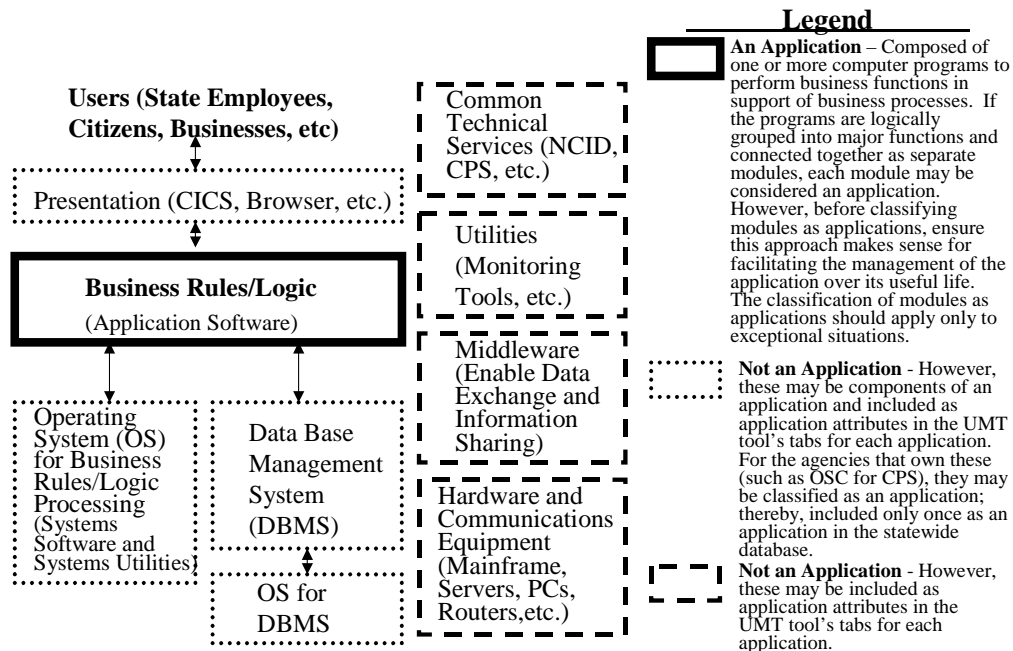
The **business/IT alignment view** is depicted as follows:

## Definition of an Application – Business / IT Alignment View Business / IT Alignment



The diagram below illustrates the **technical architectural view** of an application.

## Definition of an Application - Technical Architectural View





While a multitude of different types of computer programs (software) and equipment components (hardware) can be included in or support an application, the applications portfolio management activity focuses on the application software as the primary inventory item. This is similar to the business case and project being the inventory items for investment portfolio management and project portfolio management activities, respectively.

Even though primary attention is given to the application and its associated software that directly supports business processes and their associated business functions, the analyses and evaluations of applications and the decision making processes for managing them include the collection and review of attributes for their supporting hardware and software components. In addition to identifying the part – business rules and logic (application software) – that is the focus of study, the technical view above shows representative technical components that are cataloged and analyzed as part of the evaluation of an application. For example, while the main identity is the application software itself, the UMT tool will keep data about its associated operating system, DBMS, hardware type, technical services it uses, etc. Characteristics of the technical components that support the business rules/logic software are reviewed as part of the overall analysis of the application.

An application may be very large and complex, so that it may be technically and logically organized into major modules to process more involved business functions. Since these bigger applications may be composed of a collection of closely coupled groups of computer programs to perform interrelated business activities, the question often arises as to whether these applications should be inventoried, evaluated, and managed as one or as individual modules. This is a tricky question, and an approach toward addressing it may be to focus on two criteria, described below.

- **How will the application be managed over its useful life?** Will it be renovated, technically or functionally enhanced, consolidated, or replaced as a whole or as individual modules? Is it easier and simpler to review its financial, operational, technical, and business status and plan for its future from a module or whole perspective? How does the business management look at it (by module or as a whole), especially if requesting additional funds to renovate or replace it?
- **What is the most efficient and effective way to collect and analyze data about it and its supporting hardware and software components?** Modules mean more inventory items, more data attributes to collect and maintain, more analyses to perform, and more plans to make. Costs may be the determining element, as costs per module may be difficult to collect.

A question frequently arises as to what applications to include in the UMT database for ongoing analyses and management. A general rule is all operational applications that merit periodic review and determination of approaches for short- and long-term management actions should be included. The following items deserve elaboration in making this decision:

- Age – How old or young an application is should have no bearing on whether to include it in the applications portfolio management process. More mature applications may present cost or risk issues. Applications that have been recently implemented or partially implemented (if the implementation project is a phased one or using a phased rollout) should be included, as these may offer opportunities for providing more value or better benefits with cost-effective enhancements, as well as present unique risk problems. In fact, a part of the project closeout procedure is to add the application to the application portfolio management database in the UMT tool.
- Size – Diminutive size or narrow scope of use are not (by themselves) restrictive considerations for determining whether to include applications in the portfolio management inventory. Small applications supporting a limited number of users should be considered for inclusion. While appearing to be insufficient, the smaller applications may be extremely important to the agency or governmental program, and they may not be adequately managed if excluded from the applications portfolio management process. A PC-based computer program employing an Access database and having a user base of one or few people may fit the definition of an application.

However, applications licensed through statewide enterprise contracts and related more to office automation or personal productivity than to the support of business processes or functions of governmental programs should be excluded from applications portfolio management. Examples of these applications include products from Microsoft, such as Word and Excel, and they and their contracts will be inventoried and managed through a separate asset management initiative. The asset management inventory will include these software items, as well as infrastructure hardware (such as PCs, servers, laptops, communications equipment, etc.).

- Criticality to agency operations – An application does not have to be mission-critical to be included. In fact, the vast majority of applications are important, but not of the highest criticality. These less vital applications also deserve to be inventoried, analyzed, and managed, because they represent significant initial and ongoing financial

commitments and offer potentially serious exposures for operational, technical, security, and business risks.

#### Additional Guidelines

- **Versions:** It is not recommended to track versions of applications separately. As applications are upgraded/enhanced, new version information can be captured in the *Latest Release* and *Release Notes* fields and any associated technical attributes.
- **Productivity Tools:** Generally, individual spreadsheets and desktop databases are not applications, except in cases where these tools are crucial in routine processes. In that case they can be tracked at the agency's discretion. Some suggested guidelines for tracking these tools as applications might be if they:
  - Directly contribute to a business process or support business function(s)
  - Are actively supported by the systems community
  - Act as an automation link among applications
  - Incur significant support costs

## **Appendix 3 – The Role of Costs in Managing Applications**

### **Background**

Under increasing fiscal pressures for obtaining greater results from taxpayer dollars, state government must explore opportunities to innovate and maximize business benefits and public value through technology. Although the economy may be recovering, the state is facing tight budgets, and fiscal resources must be allocated where they provide the greatest benefits. A significant opportunity for value creation and cost-effectiveness in spending is through the understanding, leveraging, extending, and rationalizing of existing technology investments, specifically legacy applications.

The purpose of application portfolio management (APM) is to inventory, assess, and develop management plans for individual applications and each agency's and the state's application portfolios. Assessments of applications are performed by using a variety of evaluation criteria, including alignment with agency strategic missions and governmental priorities, benefit and value to governmental programs and agency business, performance (business, operational, and technical), cost to maintain and operate, technical architectural fit, and risk. Four key uses of APM in supporting the management of applications are:

1. Identify high-risk applications (serious vulnerabilities with severe impacts) and assist in developing remediation approaches.
2. Identify areas of over- and under-investments in support and remediation activities and help in determining strategies for the reallocation of budgets to more appropriately match expenditures with the needs to mitigate risks and maximize benefits and results.
3. Determine the short- and long-term strategies and develop cost-effective plans for applications over their useful lives. That is, create a disciplined approach for the life-cycle management of applications assets, from entry into production through enhancements, renovations, and eventual consolidation or retirement.
4. Sunset or eliminate (with or without replacement) when applications are no longer cost-effective or risk-acceptable.

APM addresses maintenance and operations costs, and these expenses typically involve 60% to 80% of IT budgets – the largest part of these budgets. Per Gartner statistics, the average life of an application is eight and one-half years, and approximately 30% of an application's development cost is spent annually for maintenance and enhancements. Therefore, in a short period of time,

maintenance and enhancement costs exceed development expenses and become the substantial part of the lifetime costs of applications assets.

## **Key Definitions**

The following definitions are extracted in part from the Gartner publication How to Start Estimating Software Life Cycle Costs dated July 1, 2005.

**Portfolio Management** – A primary purpose of portfolio management is to look at capital allocation. For applications, this involves cash outlays over a period of time. The period is either the useful life (perhaps five to ten years), or a fixed number of years that is prescribed by the investment process.

**Fiscal Year** – The fiscal year for state government is from July 1 to June 30. Annual expenses are total costs incurred during this period. The software tool refers to fiscal year 2005 – 2006 as fiscal year 2006, (i.e., the last number of the fiscal year). For fiscal year 2006 – 2007, the tool refers to it as 2007 (07), etc.

**Budgeting** – For most purposes, budgeting looks at cash outlays over the next fiscal year. However for long-term planning, budgeting also may involve a multi-fiscal year rolling capital outlay plan. The NC General Assembly has mandated a five-year (current or last year plus an additional four years) plan of anticipated costs for operating, maintaining, and enhancing applications. Of course, the relative accuracy of future-year budgets decreases as the number of ‘out years’ increases (i.e., the reliability of year-four numbers is usually much less than those for the immediate next year). Budgets will need to include funds for the support (maintenance, operation, enhancement, renovation, etc.) of the current inventory of applications, adjusted for the increases driven by new applications entering into production and the decreases from applications being taken out of production.

**Application Portfolio Management** – APM is the evaluation of the inventory of the current application stock for architectural fit, for suitability to the business needs, and for the prospective costs and risks of various application investment or retirement strategies. This assessment and planning activity establishes a context for the budget process and influences the mix of new development projects.

**Maintenance** – Repetitive and ongoing work comprising very small enhancements (less than two weeks in duration) to keep the application functioning. Types of maintenance include corrective (defect repair), preventative (preventing a defect before it occurs), adaptive (modifications needed to maintain usability in a changing environment), and perfective (modifications to support existing business functional requirements). Maintenance is a ‘keep the lights on’ activity, and it does not add functionality.

Enhancements – These are projects that add, change, or remove software functionality. These are usually one-time and unique events, and they are should be treated as projects (often small ones).

## Cost Considerations for Managing Applications

The primary purpose of costs in evaluating individual applications and application portfolios and planning future dispositions of assets is to link capital outlays with the importance; technical, business, and operational status; and risks of the assets. The intent is not to under-invest or over-invest in applications from individual application and portfolio perspectives. The cost-effective management of applications accomplishes two objectives: (a) ensure the amounts of funds invested are aligned with agency business strategies and priorities and governmental program needs, and (b) assist agencies in meeting their fiduciary responsibilities for the stewardship of funds and integrity of assets through expenditure strategies that create the most public value for dollars invested.

The first objective means the state should spend scarce fiscal resources on the right things and the right ways to meet the right expectations of service levels and functional capabilities. The second objective addresses the need to achieve all possible savings, while maintaining the value of and minimizing the risks of failed or under performing assets. The table below illustrates a potential simplified conceptual scheme for evaluating candidate actions depending on the status of applications and their importance and worth to an agency or the state.

<b>Application Name</b>	<b>Importance to Agency or State</b>	<b>Risk Score</b>	<b>O&amp;M Cost</b>	<b>Business, Operational, and/or Technical Quality</b>	<b>Potential Actions</b>
A	Strategic and mission critical	High risk	High cost	Low quality	Action required – consolidate, retire and replace, or renovate
B	Strategic and mission critical	Low risk	High costs	High quality	Possible over funding situation – redirect funds to other applications or new development
C	Strategic and mission critical	High risk	Low cost	Low quality	Possible under funding situation – raise funding priority to mitigate risks and improve quality
D	Not mission critical and not essential	High risk	High cost	Low quality	Consider elimination or consolidation – not worth the fiscal investment
E	Not mission critical, but important to agency	Low risk	High cost	High quality	Possible over funding situation – redirect funds to other applications or new development

The reduction in the size of applications inventories and the technical simplification of the remaining applications are two effective ways to achieve cost savings. The elimination of duplicate applications or consolidations of those performing similar functions are potentially higher-payoff actions to achieve savings. The replacement or renovation of applications (especially reconfiguring to standard platforms) may simplify operations, leading to lower costs; improvements in availability, reliability, and maintainability; and easier disaster recovery/business continuity. All of the sins committed in selecting and implementing applications manifest themselves in excessive operations costs; therefore, if efficiencies are to be realized, these must be rectified in the production phase of application life cycles.

Risk is a key evaluation criterion. A non-critical, high-risk, and high-cost application should be considered for elimination or consolidation. A high-risk, strategic, but low-cost application may need a higher budgetary priority to ensure its integrity. High-risk and mission-critical applications should receive top priority for remediation considerations and funding commitments. High-risk applications that are no longer aligned with agency business strategies or political initiatives and are not important to the accomplishment of governmental programs or agency business processes may be prime candidates for elimination or consolidation.

In summary, as a minimum, actions must be taken for applications that are either no longer cost-effective or risk-acceptable, and costs play a key role in identifying these situations and developing appropriate management approaches and plans. Costs, used in concert with other analysis criterion, can also be used to:

- Allocate in a more cost-effective manner available continuation budget funds so that they are directed to the applications and uses that offer the most benefits and value to the agencies and the state. That is, spend the money where it does the most good.
- Assist in identifying opportunities and preparing justifications for funding requests to make worthwhile investments in applications that are not possible under continuation budget constraints. That is, justify obtaining additional funds for renovating, enhancing, or replacing strategic assets that are costing too much money to maintain, while still presenting problems and risks.
- Identify savings that can be redirected to other uses of funds, such as new development projects or upgrading of technical infrastructures (i.e., free up application maintenance funds for other investments and uses that provide better results and more benefits). This can be accomplished through the more appropriate allocation of capital outlays through the better management of applications.

## Appendix 4 – Mandating Legislation

### Legacy Applications

**§ 147-33.90. Analysis of State agency legacy systems.**

(a) The Office of Information Technology Services shall analyze the State's legacy information technology systems and develop a plan to ascertain the needs, costs, and time frame required for State agencies to progress to more modern information technology systems.

(b) In conducting the legacy system assessment phase of the analysis, the Office shall:

- (1) Examine the hierarchical structure and interrelated relationships within and between State agency legacy systems.
- (2) Catalog and analyze the portfolio of legacy applications in use in State agencies and consider the extent to which new applications could be used concurrently with, or should replace, legacy systems.
- (3) Consider issues related to migration from legacy environments to Internet-based and client/server environments, and related to the availability of programmers and other information technology professionals with the skills to migrate legacy applications to other environments.
- (4) Study any other issue relative to the assessment of legacy information technology systems in State agencies.

(c) Upon completion of the legacy system assessment phase of the analysis, the Office shall ascertain the needs, costs, and time frame required to modernize State agency information technology. The Office shall complete this phase of the assessment by January 31, 2005, and shall report its findings and recommendations to the 2005 General Assembly. The findings and recommendations shall include a cost estimate and time line for modernization of legacy information technology systems in State agencies. The Office shall submit an ongoing, updated report on modernization needs, costs, and time lines to the General Assembly on the opening day of each biennial session. (2003-172, s. 1; 2004-129, s. 22.)



## **Planning and Financing State IT Resources**

### **§ 147-33.72B. Planning and financing State information technology resources.**

(a) In order to provide a systematic process for meeting the State's technology needs, the State Chief Information Officer shall develop a biennial State Information Technology Plan (Plan). The Plan shall be transmitted to the General Assembly by February 1 of each regular session.

(b) The Plan shall include the following elements:

- (1) An inventory of current information technology assets and major projects currently in progress. As used in this subdivision, the term "major project" includes projects subject to review and approval under G.S. 147-33.72C, or that cost more than five hundred thousand dollars (\$500,000) to implement.
- (2) An evaluation and estimation of the significant unmet needs for information technology resources over a five-year time period. The Plan shall rank the unmet needs in priority order according to their urgency.
- (3) A statement of the financial requirements posed by the significant unmet needs, together with a recommended funding schedule for each major project currently in progress or recommended for initiation during the upcoming fiscal biennium.
- (4) An analysis of opportunities for statewide initiatives that would yield significant efficiencies or improve effectiveness in State programs.

(c) Each executive agency shall biennially develop an agency information technology plan that includes the information required under subsection (b) of this section. The Office of Information Technology Services shall consult with and assist agencies in the preparation of these plans. Each agency shall submit its plan to the State Chief Information Officer by October 1 of each even-numbered year. (2004-129, s. 2.)